DOCUMENT RESUME

ED 182 633 CG 014 122

AUTHOR Lehrer, Paul M.
TITLE Uses and Abuses of Progressive Relaxation and Biofeedback in Treating Effects of Stress: The Cognitive vs. Psychophysiological vs. Behavioral Distinction.
PUB DATE Aug 79
NOTE 19p.: Paper presented at the Annual Convention of the American Psychological Association (87th, New York, NY, September 1-5, 1979)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Adults; *Anxiety; *Behavioral Counseling; Case Studies; Cognitive Processes; *Psychophysiology; State of the Art Reviews; *Stress Variables; *Training Techniques
IDENTIFIERS Behavior Modification; *Biofeedback; *Relaxation Training

ABSTRACT

Experimental, clinical, and personal observations give some support to the notions that: (1) intensive live training with anxious subjects is required in order to demonstrate that perspective relaxation has physiological effects; (2) physiological, cognitive, and behavioral symptoms of anxiety are separable and may respond differentially to various forms of treatment; (3) various relaxation techniques produce different subjective experiences; and (4) experiences of cognitive passivity are associated with higher levels of EEG alpha. Results of several case studies indicate that progressive relaxation and/or biofeedback are useful with physiological tension symptoms, and cognitively-oriented techniques, such as meditation, are appropriate treatment for cognitive anxiety symptoms. (Author)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED182633

USES AND ABUSES OF PROGRESSIVE RELAXATION AND BIOFEEDBACK IN TREATING EFFECTS OF STRESS: THE COGNITIVE VS. PSYCHOPHYSIOLOGICAL VS. BEHAVIORAL DISTINCTION

PAUL M. LEHRER

CMDNJ-RUTGERS MEDICAL SCHOOL

CG 014122

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Paul M. Lehrer

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

Paper read at the annual meeting of the American Psychological Association, New York, August, 1979

I will make two points:

1. There are many techniques in clinical use that are called "progressive relaxation," not all of which have much in common with the technique proposed by Jacobson (e.g., many techniques now in use differ from Jacobson's technique in that they are very brief, some are even tape recorded, and most make heavy use of suggestion). I will argue for a more "fundamentalist" Jacobsonian position for most applications--although I believe that these other techniques have their uses.

2. Tension is a multi-faceted thing. Not all people experience tension in the same symptoms, and each kind of tension symptom may respond best to a special kind of behavioral treatment.

Types of Relaxation Instruction

Let me start with my first point, about the different types of progressive relaxation instruction. I have recently reviewed the research literature on physiological effects of relaxation. The great majority of studies that measured EMG effects of progressive relaxation found that EMG levels are reduced more than in ordinary rest (Brandt, 1973; Staples, Coursey, & Smith, 1975; Cox, Freundlich, & Meyer, 1975; Haynes, Griffin, Mooney & Parise, 1975; Reinking & Kohl, 1975). EMG biofeedback may, in some instances, be a more powerful tehnique than progressive relaxation, or may potentiate the effect of progressive relaxation. Lower levels of frontalis EMG have been reported using EMG biofeedback than using progressive relaxation (Canter, Kondo, & Knott, 1975). However, the progressive relaxation instructions used in these studies were not particularly intensive, so I would judge that the relative merits of the two techniques in reducing frontalis EMG levels has not yet been finally decided. One study (Hutchings & Reinking, 1976) reported greater clinical effectiveness for EMG biofeedback than for

progressive relaxation in reducing suffering from tension headaches. However, we cannot easily put electrodes on all muscles of the body.

Alexander (1976) has demonstrated that EMG biofeedback from one electrode site (e.g. frontalis muscle) does not generalize to other muscle groups. Thus it would be most useful for EMG biofeedback to be used in conjunction with progressive relaxation--which works on all the muscles, without the need for equipment. EMG biofeedback may be most useful when the tension symptoms is focused in a particular muscle group--e.g., in tension headaches. On occasion I have also found EMG feedback to be a useful adjunct to progressive relaxation training when the client is not able to feel muscle sensations initially. EMG biofeedback then helps the person to discriminate gradations of muscle tension when proprioception initially is not enough. I should add, however, that such individuals must be highly motivated to be able to make use of biofeedback under these conditions, because such "proprioceptive anesthesia" often reflects severe chronic tension, and often requires numerous biofeedback sessions to overcome it. The training can be quite frustrating. Sime (1978) has described a technique of "sensory awareness training" that is designed to allow such individuals to relax sufficiently in order to be able to learn progressive relaxation. In this technique the client imagines the sensations of clothing on his body, the chair underneath him, etc., until these sensations gradually disappear, indicating that the person is becoming more relaxed.

The theory of how progressive relaxation works in treating anxiety was most clearly proposed by great neurophysiologist, Ernst Gellhorn (1958). Since a very large proportion of the afferent fibers reaching the brain, including those involved in the reticular system, emanate from within the muscles--thus carrying proprioceptive feedback signals--Gellhorn suggested that eliminating muscle tension

would decrease physiological arousal and, hence, anxiety. But does progressive relaxation produce decreases in general physiological arousal? Jacobson (1978) documents a number of cases of individuals with severe psychosomatic symptoms whose symptoms were alleviated by progressive relaxation. In modern laboratory studies of relaxation, however, these effects are revealed only under certain conditions.

1. Use Intensive instructions. Brief tape-recorded training (1-2 sessions) usually does not produce measurable physiological effects (cf. Paul & Trimble, 1969; Lehrer, 1972; Grossberg, 1965); and, when it does, there is usually no generalization to a post-treatment task (e.g., Brandt, 1973, found some autonomic effects during tape-recorded training, but not 3-4 minutes afterward, when S's were exposed to a few brief loud tones). Gordon Paul, found significant autonomic effects during live training (Paul, 1969) but not during tape-recorded training (Paul & Trimble, 1970). He interpreted these results as indicating that subjects needed the trainer's feedback and tailor-made instructions in order to learn to relax sufficiently to show physiological effects. In their literature review on experimental studies of progressive relaxation Borkovec and Sides (1979) concluded that progressive relaxation only produces reliable physiological changes after relatively prolonged training, and Greenwood and Benson (1977) in their review of studies of brief progressive relaxation training, found few physiological effects.

2. Study Anxious individuals. In a study I recently completed, in which I gave four sessions of live individual training and did test for generalization (i.e., I tested S's several days after the last relaxation training session), I found that normal subjects showed autonomic habituation to the experimental situation (including responses to loud tones and a reaction time task), with or without relaxation instruction, although anxiety neurotics only habituated when they were

given relaxation instruction. After relaxation training their physiological profile looked like that of the normal S's Treatment effects were significant only for the patients (Lehrer, 1978).

3. Study S's under stressful conditions. Richard Lazarus used brief training and normal S's in one of his studies, but he tested them while they were watching a stressful film, and found that relaxation produced significantly lower heart rate and skin conductance reactivity. Similarly in my data I did not find any autonomic differences even among patients in tonic levels of tension between relaxation and a no treatment control condition. All the differences I did find were in measures of reactivity to the aversive tones, even among the anxious S's (Lehrer, 1978). In normal subjects, however, the stress must be quite intense in order for relaxation instruction to make a difference. In an early study of mine (Lehrer, 1972) I asked normal subjects to close their eyes and to relax while I gave them a series of 40 electric shocks. Some of them relaxed so deeply they were on the verge of sleep even while they were being shocked. This happened both among subjects who had been trained to relax and subjects who had not been trained. There were few physiological differences between subjects in the Relaxation and No Instructions groups. In more severe stress, however, relaxation training effects are evident in normal subjects. Recently we crowded groups of four male subjects into a very small chamber and found that they did not show physiological habituation within sessions or across three weekly testing sessions (Lehrer, Epstein, & Woolfolk, 1978). Some preliminary data, however, indicate that brief progressive relaxation instruction does not produce some decrement in arousal (Karlin, Katz, Epstein, & Woolfolk, 1979).

The Technique of Relaxation Instruction

My usual technique, as Jacobson's original technique involves (a) training

people to recognize very small amounts of muscle tension, vs. only gross changes. I ask S's to tense their muscles as little as possible, even during training. Also my technique emphasizes self control. Thus, as Jacboson does, I often leave the room in between instructions to the trainee, and question the trainee afterward on what he or she has been thinking and working on during this period. In this way the self-control aspects of the technique are emphasized.

The way I teach it, progressive relaxation can be learned in between 5 and 10 biweekly sessions (about 2-5 months) which is still much shorter than Jacobson's own procedure. I find this most useful for people who experience anxiety physiologically: e.g., with aches and pains or psychosomatic symptoms, or with "panic attacks" that have a strong physiological component. I have treated several patients for whom the briefer relaxation techniques had previously been unsuccessful, but who could be taught to control panic attacks.

I do not, however, think that this intensive technique must be used all the time, e.g., many phobias appear to have a much stronger component of behavioral avoidance or cognitive worry (e.g., catastrophizing) than of psychophysiological arousal (cf. Marks, 1969). Studies have shown that for isolated phobias relaxation is not even necessary for the effectiveness of systematic desensitization. Certainly desensitization procedures that include brief relaxation training even tape-recorded training are often effective (Rachman, 1965, 1967; Paul, 1966; Cooke, 1966). Wilson & Davidson (1971) have suggested that some relaxation training may be helpful to phobics primarily for its cognitive effects: i.e., it gives them the courage to engage in the behavior of approaching the phobic situation. Without relaxation they might not be willing to engage in such behavior. Once they are engaging in approach behavior, however, the relaxation may no longer be an effective treatment component. The relaxation training thus functions as a cognitive intervention.

Cognitive therapy, which includes developing coping strategies and making positive self statements, also appears to be effective in treating phobias (Meichenbaum, Gilmore, & Fedoravicius (1971).

Intervention on the behavioral level appears to have particularly powerful effects. There is some evidence that in vivo desensitization is more powerful than imaginal desensitization (Sherman, 1972), and Bandura (1977) has suggested that the most effective treatments are those directed at changing the clients' overt behavior so that the client approaches the feared situation. Thus phobias may be most effectively treated by intervention on the cognitive and behavioral levels. This is well illustrated by a phobic client of mine in whom an operant intervention appeared to have been crucial. He was agoraphobic, and afraid to drive, unless he was accompanied by his wife. His job required a lot of driving, and his wife felt like a prisoner to his symptom. After much preliminary work with both of them, including over 10 sessions of training in progressive relaxation, he finally only pushed himself to drive to work by himself after his wife was encouraged to get a job herself, so she could not accompany him. Here, as in most phobias, the most effective intervention was on the behavioral level, because to a large extent, agoraphobia is a behavioral problem--i.e., agoraphobic individuals do not go places. The behavior of going places must be addressed directly.

The Multifaceted Nature of Anxiety and Its Treatment

There is much evidence that physiological, cognitive, and behavioral aspects of anxiety are not well correlated with each other. Peter Lang (1968) has demonstrated in laboratory studies that individuals who say they fear snakes the most are not necessarily the ones who have the greatest physiological reactions to an encounter with a snake; and neither of these are good predictors of how close an individual will come to actually touching a live snake. Davidson & Schwartz (1976) have suggested that each of these kinds of anxiety symptoms (physiological,

cognitive, and behavioral) may require different kinds of relaxation training. I and Woolfolk have developed a factor analytically derived, paper and pencil scale that discriminates trait measures of physiological, cognitive, and behavioral symptoms of anxiety (Lehrer & Woolfolk, 1978). In a recent study by Shannon (1979), our scale was used in a study of behavioral and cognitive techniques in group counseling of anxious college freshman. He found that behavioral treatment (i.e., communication skills training through such techniques as rehearsal and modeling) produced significant symptom reductions only on the Behavioral Avoidance subscale of our inventory, and that cognitive treatment (primarily rational emotive therapy) produced significant symptom reductions only on the Cognitive subscale.

I have also seen examples of the desynchrony between cognitive, behavioral, and physiological symptoms in my clinical practice, and have used the interplay between these systems in facilitating treatment. Let me give some examples.

Case 1. I once treated a 32 year old female client who feared that, if she were to relax, she would completely lose control of herself, and become aggressive and sexually promiscuous--rather than overly meek and sexually repressed as she was. She was not able to learn progressive relaxation at all. However, she achieved what she described as deep levels of relaxation while she was under hypnosis. Under hypnosis, she apparently felt that she was no longer responsible for her actions, so she could afford to let herself relax. In this case, however, she--as other clients with whom I used hypnosis--did not relax physiologically. Her level of muscle tension remained high, as measured by the electromyograph. Hypnotically induced relaxation appeared to have its greatest effects on cognitive symptoms of anxiety.

Case 2. Similarly I treated an obsessive-compulsive lady in her mid forties

who was a compulsive housekeeper. When she wasn't cleaning, she was worrying about how clean her house was, yet she claimed she did not enjoy housekeeping. As the previous client, she was afraid to relinquish control, and I was not successful in teaching her to relax. Once I tried to give her the experience of relaxation--drug induced--so that she could become desensitized to the experience. A psychiatrist agreed to give her an introvenous infusion of brevital--a short-acting barbiturate. While he was administering the drug and speaking with her, I was monitoring her physiological activity on a polygraph. Physiologically she became extraordinarily relaxed. Skin conductance fluctuations virtually ceased, and her heartbeat and respiration rate became slower and more regular. However, she reported that she had never in her whole life been so anxious. The anxiety persisted for the remainder of the day--for hours after the drug had completely left her system. Here was an example of physiological relaxation with cognitive arousal. This lady was eventually helped by intervention on the behavioral level. She was briefly hospitalized so that she could not clean house and, afterward, an arrangement was made with her family, whereby she was permitted to do no more than two hours of housework per day. If she did more, her family was to mess up the house again. Also, in another successful behavioral intervention she was admitted to our psychiatric rehabilitation program, where she became a leader in the kitchen and housekeeping departments.

I have found that some mild forms of cognitive anxiety symptoms do respond to progressive relaxation training--a physiologically-oriented technique, as categorized by Davidson & Schwartz. Jacobson reports that, when a person's eyes and vocal chords are completely relaxed, the person is unable to think--and, hence to worry. In some more severe cases of cognitive anxiety, however, this does not always work. Several of my clients could not learn to relax at all because they feared relin-

quishing a sensation of "control." Some of these were helped by hypnosis, which may be considered a cognitive intervention. Some individuals are troubled, early in training, by intruding worrisome thoughts, which interfere with their being able to practice and to learn the technique. In a few such cases I gave the individuals biofeedback for skin conductance. Just listening to the tone--which told them how much their hands were sweating--apparently blocked the intrusive thoughts. A possibly more effective technique for blocking intrusive thoughts--which can be viewed as cognitive anxiety symptoms--would be to use a meditative technique, such as transcendental meditation or clinically standardized meditation (Carrington, 1977). These techniques involve repeating a word to oneself--preferably a nonsense or foreign word whose sound is soothing. Davidson and Schwartz (1976) have argued that these techniques should be particularly effective in blocking cognitive symptoms of anxiety because they utilize the same brain mechanisms: i.e., those involved in forming words. We have some recent self-report data strongly suggesting that meditation reduces cognitive anxiety symptoms more than brief training in progressive relaxation (Schoicket, Lehrer, Carrington, & Woolfolk, 1979). Also, the same study suggested that meditation appears to produce marked increases in frontal EEG alpha. A previous study in our laboratory confirmed that finding that, on the other hand, progressive relaxation in normal S's <u>blocks</u> EEG alpha while it decreases sympathetic reactivity (Lehrer, 1978). This is consistent with some experiences of mine and my students at Lester Fehmi's laboratory. Fehmi has devised a system of recording EEG alpha in which the alpha from five sites on the head (one site over each of the five lobes) is summed electrically, such that the resultant signal is a measure of "in-phase" alpha throughout the brain (Fehmi, 1978). Our personal experiences in his laboratory were that alpha was greatest when we cleared our minds of directed thought. Fehmi (1975)

calls this "open focus" of attention, and has devised a technique called "open focus training" to help people to enter this state. We found that progressive relaxation did not directly lead us to produce more alpha, and sometimes blocked alpha production. The mental focus required to "check" the proprioceptive muscular sensations was apparently incompatible with alpha production. We interpret these data and these experiences to suggest that EEG alpha may be a physiological marker of cognitive relaxation, and that meditation techniques may be more effective than brief progressive relaxation training in producing this state--despite the fact that PR effectively diminishes physiological aspects of anxiety --and does so, at times, even more so than meditation training. Our experiences in Fehmi's laboratory suggest that this may also be true for more extensive training in progressive relaxation, but this requires further experimental verification.

Biofeedback and the Problem of Specificity of Treatment

The issue of specificity of treatment for various symptoms of tension is best spelled out in the biofeedback literature. Studies of voluntary control of specific autonomic functions used other physiological functions as controls to show that the changes were restricted to the specific functions being studied. Thus Shapiro, Crider, & Tursky (1964) demonstrated that skin conductance could be controlled without affecting heart rate or muscle tension; and Shapiro, Tursky, & Schwartz (1970) and Schwartz (1972) demonstrated that even two functions as closely related as heart rate and blood pressure could be independently controlled. However, the evidence for treatment specificity in studies of biofeedback and psychosomatic disease have been less clear. Biofeedback techniques have been gaining increasing acceptance in the treatment of stress-related psychosomatic disease processes. Thus there is an increasing body of evidence indicating that finger temperature biofeedback (often accompanied by autogenic training instructions) is effective as a treatment for Raynaud's disease (cf. review by Taub & Stroebel, 1978) and for classical migraine

headaches (cf. review by Diamond, Diamond-Falk, & DeVeno, 1978) that tension headaches and myofacial pain can be effectively treated by EMG biofeedback often accompanied by progressive relaxation instructions (cf. review by Budzynski, 1978); and that hypertension can, within limits, be treated by blood pressure biofeedback, often accompanied by one of the Western or Eastern meditation, relaxation, or general physiological self-control disciplines (cf. review by Blanchard, 1977). However, these disorders each reflect a complex of symptoms that involve several physiological systems. Thus EMG feedback and progressive relaxation are often sometimes also found to be effective in treating vascular headaches (cf. review by Diamond, Diamond-Falk, & DeVeno, 1978): and Taub & Stroebel (1978) have concluded that the literature on biofeedback for vasoconstrictive syndromes, including Raynaud's disease, does not rule out the possibility that the beneficial effects of biofeedback are due to general relaxation training rather than to specific vascular training produced by specific biofeedback techniques.

Motivation

In choosing a relaxation technique for an individual, a paramount concern should be the person's enjoyment of it and his/her motivation to practice it. In several of our studies we found no personality traits that predicted what relaxation method an individual preferred, but we have found that those individuals who stopped practicing their technique showed less symptom reduction than those who continued. Dropout rates over long periods of time can approach 80-90%. In my own clinical experience, people who are most attracted to progressive relaxation as a relaxation technique are those who have a specific interest in how their muscles function (e.g., musicians, dancers, actors, athletes, persons with muscular tension symptoms, etc.). The factor of motivation may be found to be more important than any of the other factors I described in helping the clinician to decide what relaxation technique to use, if any. If the client will not practice it, it simply will not work.

Conclusions

When, then, should progressive relaxation be used as a treatment of choice, and when biofeedback? Motivation, of course, is a key factor. Beyond that, I suggest that we follow the advice given by Davidson and Schwartz (1976): use progressive relaxation and/or biofeedback for physiological tension symptoms. Use cognitively oriented techniques, including meditation, as treatments for cognitive anxiety symptoms. If progressive relaxation is chosen as a technique, research and clinical data both suggest that the intensity of training should also be determined by the kinds of symptoms that the individual has. Physiological effects are only found when intensive training is used. Tension symptoms in specific muscles are often best alleviated by a combination of progressive relaxation instruction and EMG biofeedback. Phobic anxiety, on the other hand, often can be treated by very brief progressive relaxation instruction, with greater emphasis given to behavioral and cognitive techniques.

REFERENCES

Alexander, A.B. An experimental test of assumptions related to the use of EMG biofeedback as a general relaxation training technique. Psychophysiology, 1975, 12, 656-662.

Bandura, A. Self efficacy: Toward a unifying theory of behavioral change. Psychological Review, 1977, 84, 191-215.

Blanchard, E.B. Biofeedback and the modification of cardiovascular dysfunctions. Paper presented at symposium entitled: clinical applications of biofeedback: Appraisal and status. Department of Psychology, University of Texas at Arlington, March, 1977.

Borkovec, T. & Sides, K. Critical procedural variables related to the physiological effects of progressive relaxation: A review. Behaviour Research and Therapy, 1979, 17, 119-126.

Brandt, K. The effects of relaxation training with analog HR feedback on basal levels of arousal and response to aversive tones in groups selected according to Fear Survey Schedule scores. Psychophysiology, 1974, 11, 242 (Abstract).

Budzynski, T. Biofeedback in the treatment of muscle contraction (tension) headache. Biofeedback and Self-Regulation, 1978, 3, 409-434.

Carver, A., Kondo, C.Y., & Knott, J.R. A comparison of EMG feedback and progressive muscle relaxation training in anxiety neurosis. British Journal of Psychiatry, 1975, 127, 470-477.

Carrington, P. Freedom in Medication. Garden City, N.Y.: Anchor Press, 1977.

Cooke, G. The efficacy of two desensitization procedures. Behaviour Research and Therapy, 1966, 4, 17-24.

Cox, D.H., Freundlich, A. & Meyer, R.G. Differential effectiveness of electromyograph feedback, verbal relaxation instructions, and medication placebo with tension headache. Journal of Consulting and Clinical Psychology, 1975, 43, 892-898.

Davidson, R.J. & Schwartz, G.E. The psychobiology of relaxation and related states: A multiprocess theory. In D. Mostofsky (Ed.), Behavior control and modification of physiological activity. New York: Prentice-Hall, 1976.

Diamond, S., Diamond-Falk, J., & DeVeno, T. Biofeedback in the treatment of vascular headache. Biofeedback and Self-Regulation, 1979, 3, 385-408.

Fehmi, L. EEG biofeedback, multi-channel synchrony training and attention. In Sugerman, A. (Ed.), Expanding dimensions of consciousness. New York: Springer, 1978.

Fehmi, L. Open focus training. Workshop presented at the annual meeting of the Biofeedback Research Society, Feb. 5, 1975.

Gellhorn, E. The physiological basis of neuromuscular relaxation. Archives of Internal Medicine, 1958, 102, 393-399.

Greenwood, M.M. & Benson, H. The efficacy of progressive relaxation in systematic desensitization and a proposal for an alternative competing response--the relaxation response. Behaviour Research and Therapy, 1977, 15, 337-343.

Grossberg, J.M. The physiological effectiveness of brief training in differential muscle relaxation (Tech. Rep. No. 9). La Jolla, Calif.: Western Behavioral Sciences Institute, 1965.

Haynes, S.N., Griffin, P., & Mooney, D., & Parise, M. Electromyographic feedback and relaxation instructions in the treatment of muscle contraction headache. Behavior Therapy, 1975, 6, 672-678.

Hutchings, D.F., & Reinking, R.H. Tension headaches: What form of therapy is most effective? Biofeedback and Self-Regulation, 1976, 1, 183-190.

Jacobson, E., Progressive relaxation. Chicago: University of Chicago Press, 1938.

Karlin, R., Katz, S., Epstein, Y., & Woolfolk, R.L. Clinical interventions to reduce crowding stress: A preliminary investigation. Environmental Psychology and Nonverbal Behavior, in press, 1979.

Lang, P. Fear reduction and fear behavior: problems in treating a construct. In Schlien, J.M. (Ed.), Research in Psychotherapy, Vol. 3. Washington:

American Psychological Association, 1968.

Lehrer, P.M. Physiological effects of relaxation in a double-blind analog of desensitization. Behavior Therapy, 1972, 3, 193-207.

Lehrer, P.M. Psychophysiological effects of progressive relaxation in anxiety neurotic patients and cf progressive relaxation and alpha feedback in non-patients. Journal of Consulting and Clinical Psychology, 1978, 46, 389-404.

Lehrer, P.M., Epstein, Y., & Woolfolk, R.L. Crowding as a nonhabituating stressor: Physiological and cognitive findings. Psychophysiology, 1978, 16, 196. (Abstract)

Lehrer, P.M. & Woolfolk, R.L. Physiological, cognitive, and behavioral dimensions of anxiety: a factor analytic study with some data on sex differences. Paper presented at the meeting of the Eastern Psychological Association, Washington, D.C., March, 1978.

Marks, I. Fears and phobias. London: William Heinemann, 1969.

Merchenbaum, D., Gilmore, J., & Fedoravicius, A. Group insight vs. group desensitization in treating speech anxiety. Journal of Consulting and Clinical Psychology, 1971, 77, 115-126.

Paul, G.L. Insight versus desensitization in psychotherapy. Stanford, CA: Stanford University Press, 1966.

Paul, G.L. Physiological effects of relaxation training and hypnotic suggestion. Journal of Abnormal Psychology, 1969, 74, 425-437.

Paul, G.L. & Trimble, R.W. Recorded vs. "live" relaxation training and hypnotic suggestion: comparative effectiveness for reducing physiological activity and inhibiting stress response. Behavior Therapy, 1979, 1, 285-302.

Rachman, S. Studies in desensitization - I. the separate effects of relaxation and desensitization. Behaviour Research and Therapy, 1965 3, 245-251.

Rachman, S. Systematic desensitization. Psychological Bulletin, 1967, 67, 93-103.

Rachman, S. The role of muscular relaxation in desensitization therapy. Behaviour Research and Therapy, 1968, 6, 159-166.

Reinking, R.H. & Kohl, M.L. Effects of various forms of relaxation training on physiological and self-report measures of relaxation. Journal of Consulting and Clinical Psychology, 1975, 43, 595-600.

Schwartz, G.E. Voluntary control of human cardiovascular integration and differentiation through feedback and reward. Science, 1972, 175, 90-93.

Shapiro, D. Tursky, B., & Schwartz, G.E. Differentiation of heart rate and blood pressure in man by operant conditioning. Psychosomatic Medicine, 1970, 32, 417-423.

Shapiro, D., Crider, A.B., & Tursky, B. Differentiation of an autonomic response through operant conditioning. Psychonomic Science, 1964, 1, 147-148.

Shannon, J. Personal communication, 1979.

Sherman, A.R. Real-life exposure as a primary therapeutic factor in the desensitization treatment of fear. Journal of Abnormal Psychology, 1972, 79, 19-28.

Sime, W. Sensory awareness training. Paper presented at the annual meeting of the American Association for the Advancement of Tension Control, Chicago, October, 1978.

Staples, R., Coursey, R. & Smith, B. A comparison of EMG feedback, autogenic and progressive training as relaxation techniques. Paper presented at the meeting of the Biofeedback Research Society, Monterey, California, October 1975.

T aub, E. & Stroebel, C.F. Biofeedback in the treatment of vasoconstrictive

syndromes. Biofeedback and Self-Regulation, 1978, 3, 363-374.

Wilson, G.T. & Davison, G.C. Processes of fear reduction in systematic desensitization. Psychological Bulletin, 1971, 76, 1-14.